

## Claims

1. In a magnetic optical element having a Faraday rotator and a polarizer provided integrally on the light transmitting surface of the Faraday rotator;

a magnetic optical element characterized by being constituted of i) a Faraday rotator on each side of which an anti-reflection film has been formed and ii) a polarizer comprising photonic crystals which has been formed on one anti-reflection film.

2. A magnetic optical element for a semidouble-type optical isolator, characterized in that a pair of magnetic optical elements according to claim 1 are respectively laminated to a one-sheet glass polarizer on its inside and outside in such a way that each polarizer comprising photonic crystals is provided on the outside.

3. The magnetic optical element according to claim 1 or 2, wherein said photonic crystals are those obtained by alternately layering transparent high refractive index and low refractive index mediums on rows of periodic grooves or linear projections while keeping the shape of interfaces.

4. The magnetic optical element according to claim 1 or 2, wherein said photonic crystals are those obtained by forming periodic grooves by lithography.

5 5. The magnetic optical element according to any one of claims 1 to 4, wherein an anti-reflection film has been formed on the surface of the polarizer comprising photonic crystals.

10 6. The magnetic optical element according to any one of claims 1 to 5, wherein the outermost layer of said anti-reflection film on which the polarizer comprising photonic crystals is formed is an SiO<sub>2</sub> layer.

15 7. In a process for producing the magnetic optical element according to claim 6, a magnetic optical element production process characterized by having steps comprising:

the step of forming on one surface side of a  
20 Faraday rotator an anti-reflection film for a photonic-crystal polarizer, formed of a dielectric multi-layer film the outermost layer of which is an SiO<sub>2</sub> layer;

the step of forming periodic grooves in the SiO<sub>2</sub>  
25 layer of the anti-reflection film formed;

the step of layering on the surface of the SiO<sub>2</sub>

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layer of the anti-reflection film in which layer the grooves have been formed, amorphous  $\text{SiO}_2$  layers and amorphous Si layers alternately and while keeping the shape of the grooves in each layer, to form a

5 polarizer comprising photonic crystals; and

the step of forming an anti-reflection film for air or for an adhesive, on the Faraday rotator at least on its surface side where the polarizer is not formed.

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8. In a process for producing the magnetic optical element according to claim 6, a magnetic optical element production process characterized by having steps comprising:

15 the step of forming on one surface side of a Faraday rotator an anti-reflection film for a photonic-crystal polarizer, formed of a dielectric multi-layer film the outermost layer of which is an  $\text{SiO}_2$  layer;

20 the step of forming on the  $\text{SiO}_2$  layer of this anti-reflection film a second  $\text{SiO}_2$  layer for forming photonic crystals;

the step of forming on the second  $\text{SiO}_2$  layer formed a resist mask for forming photonic crystals,  
25 and etching the second  $\text{SiO}_2$  layer at its areas uncovered through the mask, to form periodic grooves

-37-

which constitute photonic crystals; and

the step of removing the resist mask remaining on the polarizer comprising the photonic crystals and thereafter forming an anti-reflection film for air or  
5 for an adhesive, on the Faraday rotator at least on its surface side where the polarizer is not formed.

9. An optical isolator characterized by having a substrate for placing thereon an optical isolator, a  
10 glass polarizer disposed on the substrate, the magnetic optical element according to claim 1 which has been so disposed on the substrate that the Faraday rotator side is set opposite to the glass polarizer, and a magnet which imparts a saturated magnetic field  
15 to the Faraday rotator.

10. An optical isolator characterized by having a sectionally U-shaped magnet, a glass polarizer disposed inside the U-portion of the magnet, and the  
20 magnetic optical element according to claim 1 which has been so disposed inside the U-portion that the Faraday rotator side is set opposite to the glass polarizer.

25 11. A broadband semidouble-type optical isolator characterized by having a substrate for placing

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-38-

thereon an optical isolator, the magnetic optical elements for a semidouble-type optical isolator according to claim 2 which are disposed on the substrate, and a magnet which imparts a saturated  
5 magnetic field to each Faraday rotator of the magnetic optical elements for a semidouble-type optical isolator.

12. A broadband semidouble-type optical isolator  
10 characterized by having a sectionally U-shaped magnet, and the magnetic optical element for a semidouble-type optical isolator according to claim 2 which has been disposed inside the U-portion of the magnet.